

Canal Zone Notes
Book #4

U. S. GEOLOGICAL SURVEY

GEOLOGIC BRANCH

LOOSE-LEAF FIELD NOTEBOOK

Canal Zone Notes
Book # 4

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8,9-15	Section of Fullers Earth beds &c	Samples
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21	Maloná Island	sp. 331
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Friday

Jan 14/32

[Faint handwritten notes and sketches on the right page, including a small diagram of a hill or mound.]

3
Sat June 16/12 - Up Laredo
Went up right hand branch
of river, Rio Sima, to new
observation station, say 3 miles
above junction of mouth of
Simá. Here fine goodly
exposure of sand & silt.
Galena clay sand with some
sandy beds. Almost horizontal
new country, rounded ridge
up to 75 feet above river. No
fossils and the sand is
up to 4 to 5 miles above
the station first name.
Upper Galena clay with some
plant bones. It is very fine
and somewhat friable.
These conglomerate pebbles are some-
times hard, fine grained sand with the
pebbles and other bones and
fragments of shells. The pebbles
are seen on the tops of the
highest hills which are only
75 feet above the river.
In a few places along the
river there are small

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It may be that these are not
hills present a. b. c. d. e. f. g. h. i. j. k. l. m. n. o. p. q. r. s. t. u. v. w. x. y. z. In
fact it looks that way. and it
may be that these hills are
the more isolated residue of
the conglomerate which was
over by the conglomerate
process.

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Laguarda is a hill which
is more or less above the
present level of the river. It
is a typical fluvial
sandstone with some light
grayish mud layers and
no limestone on its top.

That is what we have seen
at the top of the hill. It is
a typical hill of the present
level of the river. It is
a typical fluvial sandstone
with some light grayish
mud layers and no limestone
on its top.

junction of the ^{or old} French Canal & Lined road
 Long exposure of light gray, yellow
 clay & clayey sandstone capped
 with on south side Hill
 about 100 feet above sea level

Shift ahead some pages
 Venado Island is chiefly
 gray limestone locally which
 iron stained and brecciated
 Locally this limestone occurs
 in rather pure but
 considerable areas of it is
 metamorphosed, shales ~~metamorphosed~~
 hydrothermally altered and
 replaced. Also found about
 the same thing found on
 Saluga.

Fullers Earth

Section in cut where

Sample 2a 72 lb came
fromcomposed fine sandy claystone
10' thickthinly bedded some thinning
out at top

2nd bed 30' thick

9' thick

(2) bed 9' thick more sandy

sandy clay 10' thick

composed of 10' thick

gates can be seen

20' thick

10' thick

beds probably not more
than 70' high as bed
thinning outJan 24/19
Fullers Earth near gate(1) Sample passed out to me
from gate and was7 feet thick and some 10 feet
of clay is shown as a
by itself and the top(2) (a) 2nd bed 12 feet thick and
fine grained light colored
claystone with some white spots(2) (b) 9 feet thick and
coarser and more sandy
looks like fine bedded
sandstone, may have some
as pebbles, powderFossil lot see section
at St 2 where fullers
earth sample came from.
Three fossils were found
above sand clay beds
but there are some others

above them

St #3 Sample #3 is yellowish
very light brownish yellow and
buff in color. It does not
seemly so good as sample
#1 or #2 because there are
some clayey streaks and some
fine sandstone in it. There is
some clayey material, possibly the
glaciation or weathered
rock material and it is
very soft. It is
perhaps somewhat hard.

St #4 Sample #4 seems to be
very good material. Very
white material. Spotted
it is still too much
about 9' of the bed shown
at the top of the cut here.

St #5 Fairly good buff fine
bed very fine white quartz
lower bed. There about 9' thick
sample from about 9' thick

St #6 19 foot bed of
fairly pure looking clay
with very few light spots
but contains (as in many other
cases) with 20 to 55 percent
soft fragmented yellow
sandstone which may have
a very little water in
pockets etc.

St #7 30 foot of Alluvium
about 12' of light colored
material lighter, lighter color
and more porous than
all the other samples seen.
It contains a large proportion
of the material which makes
the white spots in the
other samples. This
stuff may be as good
as flint hard.

June 29th Out to
 islets in Panapa Bay and
 along shore toward Chong
 Chong and islands on
 Kermadec Success formation.
 This formation is a somewhat
 colored coarse irregular surface
 which shows some similarity
 with the surface. Due to
 streaks and irregular masses
 of red hematite and also
 of brown hematite with the
 matrix greatly predominating.
 The fragments in this formation
 matrix seem to be of quartz
 altered basic rock matrix
 and some of the more white
 like flow basaltic structure
 at night in some of the
 in bedding some granitic
 lava looking material occurs
 quite locally which may be
 parts of untrapped up like
 the thin dike. Some fragments
 There appears to be some fine material

irregular quartz and calcite
small fine local breccia

Tortolita Isl.

The next island, ^{Tortolita} ~~Tortolita~~ is a rather peculiar lava agglomerate with angular fragments of dark hard fine grained lava (see spec 337/77) with some large and some irregular masses of breccia cutting off from the shape of the fragments. In fact it looks as though it might represent highly altered lava breccia. The material. Some of the breccia on this island are very fine and light grey.

Tortola Isl.

The next island, a few hundred yards from the above island is the coarse granitic breccia somewhat similar to that of the Champagne Islands. It is the only one in this area that is not

spec 337/77

Test these samples for

- (1) Phosphate
- (2) Glauconite
- (3) Calcite
- (4) Dolomite

is somewhat dark greenish brown
and the large rounded angular
fragments are more brown
humate color. This matter
gives the impression that it
might largely be a replacement
glauconitic limestone.

Toward one end of this island
a dike like or possibly
a bed of altered or
material cuts through
horizontally.

spec 337/73

For Venado Island see back
several pages

The next little island is
towards Salaga from which some
the old gray limestone

island 459
 This little gray, crystalline
 rock has a pattern like an
 igneous gneiss. The lighter spots
 in this case seem like calcite.
 On close inspection I find that
 this really is a highly altered
 quartz bearing diorite or
 gabbro (see specimens)

Meloni Island is a most
 peculiar formation. It consists
 of basalt? which shows a slight
 greenish ~~slightly~~ weathered
 surface. It is divided into
 columnar structure and
 with the columns perpendicular
 to the surface of the sea and
 from 2 to 4 feet in diameter.
 Some of them have cracks
 but at good intervals have
 some of the vertical sides
 suppressed. There is a most
 distinct horizontal fracture
 which is very much like bedding
 and which divides the whole
 into layers of from 4" to 12" thick.
 Then there is a small
 secondary cleavage more or
 less parallel to the main
 cleavage but running
 somewhat from left to right. This
 secondary cleavage is seen to
 say 2 or 3 inches apart. They seem
 cleavage changes somewhat.

locally and as clearly brought
out only where etched by
the waves (see pictures)

This structure is
wonderfully distinct and
regular where it is etched
and for a time I thought
the material was meta-
limestone (see spec)

The weathering has proceeded
from the jointing inwards
and, locally, some horizontal
action along joint planes
I have taken place

Bunga point is a main reef
Canadon island is some 100
yards across mostly just
limestone and in places
etched by waves. It is also
bedded along a joint.
This is certainly the same
formation as the island
off Fanning Bay

some exceptions (as below)
 It seems that the same formation
 that one finds right through to the
 Parana (see spec)

Point-Batle. Seems to be
 all basalt? But a second
 light-colored basalt variety
 has intruded the darker brown
 variety. This area of basalt
 is rather extensive and
 it is probably one of the many
 basalt ridges which cut
 through the and the volcanic
 formations that back up
 the divide towards Rio.

Y Spec 334
 74

Rhyolite
Pumice Island

Pumice Island

Rhyolite
Culebra Island
(Quarantine Station)

Rhyolite
Navo Island

Fleming Island Aug 20
with Prof. Kump

This island presents a 45° slope
to the ocean Southwest and
a 30° slope Northwest. The
north edge is basically level.

The core top and south side
is rhyolite about 1000 ft.
Circum Hill. The basal is
much shattered and clayed.
Spaced parallel ridges and
some sorting. Latent
angles between the blocks.
Near top of hill show some
pyrite and calcite deposits
in some of the planes.

Is the basal structure

responsible for the [?]

Find basal core 4 feet thick
this rhyolite dia 530 N 70°

Lakagellia Island

Southern side find good beach 1/2 mile long sandy, gently sloping. On E. end are what look like massive red limy tuffs. With some angular fragments of dark basaltic rock. These red rocks give some little indication of bedding and show speckles and small white crystals of calcite.

(See spec)

On the west end of beach 3 side island some black tuffs flow as banded? with tuffs. Black basaltic and some iron stone looking very punky in thin and the whole shows a much streaked metamorphosed appearance (see spec) same as at Chagorua Island.

(1914)
 Aug 21st (Friday)

Big slide occurred Aug 20 on
 east side cut north of Empire

North End at 1648

South end of slide is bounded
 by thick beds of sandstone
 by fault with displacement
 75 to 85 feet

S side of slide about 154

August 24/1912 - Watsonville
 The lower part of section is of the same material
 bedding, which is a coarse sandstone, but
 perhaps it may be a very fine sandstone
 like to 60' in the half section
 When the dip is 60' the sandstone is
 bedded material is very much broken
 in the upper part of the section
 the sandstone is very fine grained
 the lower part of the section is a
 series (of beds) 11/2 to 2 1/2 ft

In the main part of the section
 50 feet below the top of the section
 a dark sandstone is found. This is made
 up of 25' of sandstone from the top of the
 section to the top of the dark sandstone
 which is a fine grained sandstone. The
 beds are very good. The dip is 60' in
 the section. In the lower part of the section
 (beds in it of middle gray sandstone) the dip is 60'
 but in the upper part of the section
 might well be a different dip. The
 dip is 60'.

* The same beds are present in the other
 but they are sandstone and not a
 which dip 50° 55'
 30 feet below the break

to Old Farming Aug 24/12
 On S. side road at
 Kuan Xiang 3 3/4 miles out on road
 found some good looking
 clay beds almost full of
 Earth balls. These are local
 however. They seem to be built
 on top of basic tuffs.

1/2 mile along shore near the end -
 along here some volcanic tuffs
 some some very fine fragments
 & some soft coral & other
 things.

1/2 mile along shore near the end -
 saw 75 sq yds of E & S of road in
 aggregate. So they don't bury
 water containing the shells, and
 some of the ~~things~~ things
 rather islands? probably

Basic dikes to the west of
 point and point to the east
 Kuan Xiang some more in
 numerous places & spec 1/8/25

2/18/21. Shown basic tuffaceous
in coarse basic tuffaceous
which continues right along
from old Panama.

The formation along the Pacific coast of the
canal zone is a peculiar one. It consists
essentially of bedded tuffs ^{locally} of acid character
~~at least locally~~ interbedded with coarse
volcanic agglomerates and breccias ~~and~~
~~with layers of tuffs~~ the fragments of which are mostly basic.

These beds are cut by dikes mostly
large and nearly all of basic character
(see specimens already gathered). It would
be extremely difficult in fact locally
impossible to map these dikes and
would result in no particular advantage.
The uppermost of these tuffs seem to be
acid as shown near Panama
but any separate mapping of them
seems impossible at present.

Trip to Pearl Islands, Panama San Miguel Sunday Sept 1st 1912

Opp San Miguel

Rock Island Point

#1 shows bedding the edge
of strata app. in level 10,
also shows group of basins.

#2 shows a bit further 100 yds
west of #1, like bottom
Spec 115 and a short 10 ft
thick one.

It seems like an intrusion is
penetrating beneath very
rapidly. Clearly an intrusion
forms sharp end of point

505 100 yds. west of point

Spec 9 shows intrusion

Spec 10 shows intrusion being
intrusion about 1/2 mile

Section of the ridge

just across road from
peninsula where the intrusion

comes from

A good bit of the intrusion is
upright and the intrusion is

the intrusion is the same as the

truff with a good bit of the

intrusion up to a point

the intrusion is the same as the

truff from the point

more than the point

section Spec 11 Average dip

is about 20° N. West

would bring them under the
rocks up the beach where
some first described

Monday morning Sept 2. Went to
Sahoga Island off the Port of Cape
Hatteras. Bore on. 2070W 208

Spec 12 groups of fossils
13 small spec. groups

Well bedded almost even colored
cliff faces. These slaps show
good bedding and many dark
spots to the cliff show what appears
to be fossiliferous. (see) The sand
only up the slaps above the lower
part of the Cape. This is of the
clays associated with the limestone
in other places.

On further examination of the fossils
found at the beach, they are
slightly buff to clayey. The
fossils are the same general
preservation as that at Cape
Hatteras but here it is perhaps
more likely a local fossiliferous
shell. In character it is

of almost same composition
 sufficiently to give formation
 only. Faint in fossils, but
 well bedded.

Spec 14

Not common as present ^{inward}
 Sellaia yellow, another form
 of basalt cones in spec
 5/11/12 also in the
 granite

2. sunken penguin with the higher
 parts still above water. Scarcely
 is pointing in toward base
 of the Empire an old lake
 of about the same & form
 occurred as there is a fairly
 good basin there. The river
 valley (basin) is a most
 interesting, meandering
 little main down out of
 thing - a more connection of
 certain hollows that have
 left when the various
 interposed came up.

Sunday Sept 17
 went out to Pecos Valley area
 with Mr. Johnson

note that Limestone
 horizontal and in places
 rising roads all out
 of all Pecos is the same
 but very different from
 Contractor Hill material
 type

On top of the are clayey
 shales almost like the
 contact type

Limestone outcrop at
 Rio La Pita is certainly
 the same. Looking north
 toward the contact where
 limestone dips about 75° E
 type

about 1 mile S. of
 some fossiliferous outcrops
 along Little Creek and
 the western old contact
 surface. The Archean
 is much more
 in some part of the
 Archean type
 the thin bedded
 fossiliferous. The
 rock is found
 in some places
 beyond old contact
 surface.

In quarry just on west side
 old contact zone. Crude mica
 spec which overlies bluish-gray
 basic rock which shows presence
 of augite spec

Thursday Sept 19 Out

to point west of Galton

Point Guinea is very hard
fine grained basalt columns.

The comparatively homogeneous

crane breccia found all along

here this basalt columnar

is several hundred feet

thick most times 1/2

in 1/19/12. Basalt from Pt Guinea

Point Farfan Basaltic mass

seems to be similar to that at

Maloni Island. Has a sort

of lenticles or nodules

but not so noticeable

as at Maloni Island.

Spec 2/19/12 shows the position

basalt & chips from different

places

Spec 3/19/12. Narrow dark

outcrop of chert grayish but brown

when spec of thin bedded

The narrow stragg must have been
punched up on left when
dikes came up on both sides
of it.

Diorite about same as Cocaine
Island. Big outcrops all
around this point. Dike
cut by basalt. Diorite
probably from same magma
as Ancon Hill. Dike
cut by basalt.

Spec 4/19/52 Diorite

At nose of point (Farfan) near
to Ballena Lake find mylonite
dike in mass in contact with
diorite. See spec 5/19/52. The
mass is probably younger
than the ~~basalt~~ dike.

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2

Whitish mottled in layers

(2) Mud shovels beds

(3) yellow gray to whitish
sandy beds

Sept 20 - Traverse along road
from Radio signal to Chert

See map on station

(1) ^{Small layers of white till}
Boulder bed. Brownish

Some well sorted in lower part
of boulder bed. Larger in the upper
part of the section.

(2) well bedded clayey sandstone
light gray to white, massive
beds. Some are sand

at base of bed. Red thin
East of Radio signal and
S. of W. Canadian Road.

Almost horizontal
Dec 2/20/12, from base to top
of the section.

Some of the beds are
thin and shaly. Some are
thick and massive.

Found a few beds with
a lot of clay. Some
are fine grained.

Some of the fossils are small
and some are large.

Small fossils

350.25

11

Some shells appear to be
smaller than others and are of different shapes.

Some of the fossils are small
and some are large.

Some of the fossils are small
and some are large.

This limestone is somewhat
different from the other
limestone. It is of a different
color and has a different
texture. It is also of a different
shape and size.

Quarry near Old Panama
etc.

Sept 24th Trip from
~~Chiriqui~~ ~~Pedra Honda~~ to Anasco

The first thing that met us at Anasco
first conglomerate coarse
limestone or almost conglomerate.
The fragments are mostly
coarse grained and highly
decayed. They are not basaltic
but must be much older.
Probably corresponding
in age, and very probably
the same thing as the limestone
out toward Old Panama.
Beyond that find basalt
limestone practically all
the way to Anasco. This
consists of small and large
angular pieces of hard
fine grained basalt
embedded in yellowish
weathering tuffaceous
material. This formation
must be about the same

yes —

Lake Llanos formation

Are these conglomerates
or conglomerates really
resulting as to
gold hills etc. or are
the fragments older
volcanic rocks?

as the Empire Office Hill
& Paraiso breccias.

Locally there are some
masses of coarse gabbros
probably dikes similar to
those which form mountains
all over this country.

In one or two places the
trail seemed to pass over
patches of yellow weathering
sandstone, but the evidence
was not clear because the
whole formation might
be referred to the coarse
conglomerate, with sandy
beds found all along
the Pacific Coast from
Old Panama to Panama
etc.

On the whole the formation
between Canal & Arroyo should
be mapped as the coarse

Note Is the pitted surface
of the basalt on Cienfuegos
due to wind driven sand action?
Did this take place when the
lower land was submerged?
Are there two ages of basalt?
If not the basalt fragments
in the lugged tubs must
show that they are ~~very~~
much younger than the
limestone!

Luccia + hillsides of the
old Panama - Panama coast
The topography between
Colonel and Angara
comparatively flat. This
may be due to former
submergence. In fact
there is topographic support
of that Cienfuegos Colera
and the high land near
them were islands before
Gold Hill and other
high points were pushed
up. There is some
black rich soil in the
low swampy places along
the way but in all other
places there is red soil
with hard angular basalt
fragments scattered through
it.

One the majority of
three fragments of this
composition or different

Sept 25 Out from Amazon
with Hill towards Cobene

- (1) First station on Cachi divide
where Hill stops instant at
the morning (see map)

Spec 1/25/Spt shows basaltic
grayish (as is this area with shaly)
which shows as fragments,
large and angular, all along
here. Some of these are
2' to 3' in diameter. It would
be impossible to tell whether
there is a dike of this material
here or whether these fragments
are only those of a matrix
of tuff and buff-colored
or a Paraiso breccia

After hunting several hundred yards
in this vicinity and examining
many specs I find that this
volcanic rock is the only kind
represented (see spec 1/25/Spt)

These volcanic fragments
continue beyond stream (very) down

This rhyolite rock
shows peculiar regular
"laminated" flow structure
on weathered surface

Just at this very small stream
(dry in dry season) and on crusty
ridge n. of it find breccia
of which the matrix seems
to be this rhyolite rock and
the fragments older coarse
and more basic rock. However
the whole is much weathered
and the fragments especially
seem much decayed. ~~all~~
~~on both sides of~~ ~~around~~ These very small
outcrops are good fresh
fragments of rhyolite rock.

Right up to top of high peaks
ascended for Coler find same
rhyolite showing good flow
structure. Some of this
structure is at a comparatively
steep angle on the hillside as
if due to upward flow of
rhyolite lava. On top the
flow structure is local.

Locally near Aragon are
some pieces of coarse brown
gabbro and small
phyllitic fragments and some
pieces of granite. The latter
probably comes from below

where observed - almost horizontal.
On the very top is a comparatively
small area of breccia
which appears to be similar to
that at quarry near old house
as if carried upward by
intrusion of the phyllite! This
high hill then is due to
phyllite intrusion.

From here (triangulation station
Colore) looking off toward
the N.W. see a great broad
flat country clear up to the
Trinidad mountains there
are many little rising
hummocks but no chert mounds
which seem to be more
than 4 to 5 hundred feet

This seems to continue
almost clear across the
section with perhaps higher
land N. of the Trinidad

On trip out took La Pasa trail
 find this schistose rock down into
 deep gulch not far N. of
 Coler ridge. Same rock continues
 up over another high ridge
 crossed by trail. In fact
 of that ridge on way will
 down find coarse gabbro
 and some buffaceous looking
 rock to west of it (towards
 canyon) However in general
 on both sides of it find
 schistose rock so it
 seems the big basic dikes
 cutting schistose material
 or at least light gray colored
 fine grained rock which shows
 plane structure. Some locally
 crystalline but brown
 & spec. 6/24/51

than elsewhere but the amount
 more than 500 feet of that.
 The zone of interesting topography
 begins at about the second
 bend of the canal and
 around Chertones continued
 The mountain — cone shaped
 mountain is one of the
 Trinidad group. This flat top
 was probably submerged until
 a late geological date
 S E the country out to the
 coast is flat and contains
 swamps except the high sandy
 ridges app. near La Pasa

Patrol Islands show in the
 general S E direction.
 This is at about same level
 just as found locally through
 here, otherwise all schistose

